

Vaughn, Lorena

From: Nann, Barbara
Sent: Monday, July 10, 2017 2:41 PM
To: Vaughn, Lorena
Subject: FW: Petition for Reconsideration and Administrative Stay - Arkansas Regional Haze FIP - Docket No. EPA-R06-OAR-0189 [FOIA Request EPA-R6-2017-008762]
Attachments: 2016-11-22 ADEQ Petition for Reconsideration and Administrative Stay EPA-R06-OAR-2015-0189.pdf; Appendix A - ADEQ Regional Haze FIP Petition for Reconsideration.pdf; Appendix B - ADEQ Regional Haze FIP Petition for Reconsideration.pdf; Appendix C - ADEQ Regional Haze FIP Petition for Reconsideration.pdf

From: Jamie Ewing [mailto:jamie.ewing@arkansasag.gov]
Sent: Tuesday, November 22, 2016 10:09 AM
To: McCarthy, Gina <McCarthy.Gina@epa.gov>; McCabe, Janet <McCabe.Janet@epa.gov>; Curry, Ron <Curry.Ron@epa.gov>; Coleman, Sam <Coleman.Sam@epa.gov>; Gray, David <gray.david@epa.gov>; Stenger, Wren <stenger.wren@epa.gov>; Hansen, Mark <Hansen.Mark@epa.gov>; Donaldson, Guy <Donaldson.Guy@epa.gov>; Medina, Dayana <Medina.Dayana@epa.gov>; Nann, Barbara <nann.barbara@epa.gov>
Cc: keogh@adeq.state.ar.us; Chapman, Julie (Chapman@adeq.state.ar.us) <Chapman@adeq.state.ar.us>; rouse@adeq.state.ar.us; Stuart Spencer <spencer@adeq.state.ar.us>; Montgomery, William (Montgomery@adeq.state.ar.us) <Montgomery@adeq.state.ar.us>; Sarah Tacker <sarah.tacker@arkansasag.gov>
Subject: Petition for Reconsideration and Administrative Stay - Arkansas Regional Haze FIP - Docket No. EPA-R06-OAR-0189

Dear Administrator McCarthy,

Please find attached a Petition for Reconsideration and Administrative Stay, with appendices, filed on behalf of the Arkansas Department of Environmental Quality (ADEQ). The State will also be filing a Petition for Review today challenging the final rule. Paper copies of this request will follow by mail. If you have any questions about the Petition for Reconsideration and Administrative Stay, including contacting ADEQ to begin a reconsideration proceeding, please contact Stuart Spencer, Associate Director of the Office of Air Quality, ADEQ at spencer@adeq.state.ar.us or (501) 682-0750.

Thank you for your consideration of this request.

Sincerely,

Jamie Leigh Ewing
Assistant Attorney General
Office of Arkansas Attorney General Leslie Rutledge

323 Center Street, Suite 200
Little Rock, Arkansas 72201
Office: 501.682.5310 | Fax: 501.682.3895
jamie.ewing@arkansasag.gov | ArkansasAG.gov



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BEFORE THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

In re:

Promulgation of Air Quality)	
Implementation Plans; State of)	
Arkansas; Regional Haze and)	Docket No. EPA-R06-OAR-2015-0189
Interstate Visibility Transport)	
Federal Implementation Plan;)	
Final Rule)	

**PETITION FOR RECONSIDERATION AND REQUEST FOR
ADMINISTRATIVE STAY**

I. Introduction

Pursuant to Section 307 of the Clean Air Act (“CAA”),¹ the Arkansas Department of Environmental Quality (“ADEQ”) submits this Petition for Reconsideration requesting that the Administrator of the U.S. Environmental Protection Agency (“EPA”) convene a proceeding for reconsideration of the final rule, “Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan; Final Rule” (“Regional Haze FIP”).² The ADEQ also requests that the agency immediately stay the Arkansas Regional Haze FIP pending completion of its reconsideration of the final rule. Absent a stay, implementation of the rule will

¹ 42 U.S.C. § 7607(d)(7)(B).

² 81 Fed. Reg. 66332 (Sept. 27, 2016) (hereinafter “Arkansas Regional Haze FIP” or “FIP”).

require expensive and unnecessary expenditures by utilities within Arkansas which will, ultimately, be borne by electric consumers.

Given the important issues raised by this petition, the EPA should immediately contact the ADEQ to discuss an appropriate schedule and process for reconsideration with an administrative stay in place. In the event the EPA has neither granted the petition nor made alternative arrangements with the consent of the ADEQ to establish a schedule for reconsideration within seventy (70) days of receipt of this request, such inaction will be deemed a denial of the petition.

II. The State raises objections that support reconsideration of the Regional Haze FIP.

The Clean Air Act requires the EPA to convene an administrative proceeding for reconsideration of a rule if a party raising an objection to the rule demonstrates to the EPA that: 1) it was impracticable to raise the objection during the comment period, or that the grounds for such objection arose after the comment period but within the time specified for judicial review; and 2) the objection is of central relevance to the outcome of the rule.³ The objections raised in the sections below are of central relevance to the outcome of the final Regional Haze FIP. Considering the new information presented below, the EPA should reach a different outcome in the rulemaking. This new information provides substantial support for revision of the Regional Haze FIP.

³ 42 U.S.C. § 7607(d)(7)(B).

- a. The EPA should reconsider emission controls on Independence in light of recent IMPROVE monitoring data which shows that Arkansas has already achieved the amount of progress required for this planning period.**

The EPA believes that the reasonable progress four-factor analysis requires additional controls for the Entergy Independence Power Plant ("Independence").⁴ However, the EPA should reconsider whether controls on Independence are necessary under the Clean Air Act because 2015 monitoring data shows that Arkansas is currently meeting the reasonable progress goals set in the FIP and will continue to meet those goals for remainder of the first planning period.⁵ Therefore, further controls on Independence are not necessary to achieve reasonable progress.

It was impracticable to raise this objection during the public comment period for two reasons. First, the 2015 monitoring data were not available at the time the draft rule was released. Since the close of the comment period for the proposed Regional Haze FIP on April 8, 2015, measured concentration data for January 2015 through September 2015 from the IMPROVE network of Class I Federal area monitors became available.⁶ This monitoring data is the most recent available and shows that visibility values for both Caney Creek and Upper Buffalo are not only well below the Uniform Rate of Progress but also well below the reasonable progress goals set by the EPA in the Regional Haze FIP.

⁴ 81 Fed. Reg. 66332, 66350.

⁵ Interagency Monitoring of Protected Visibility Environment, accessed at <http://vista.cira.colostate.edu/Improve/>.

⁶ The public comment period was reopened twice in 2016 but each instance was limited to specific portions of the proposal not related to this data.

Second, EPA revised the final reasonable progress goals for this planning period downwards so that it would not have been possible to raise an objection during the comment period regarding actual visibility conditions being below the final reasonable progress goals because both visibility conditions and goals are components of that objection.

Wilderness Area	Disapproved 2008 RH SIP RPG	Proposed FIP RPG	Final RH FIP RPG	2015 Actual Conditions
Caney Creek	22.48	22.27	22.47	20.41
Upper Buffalo	22.52	22.33	22.51	19.96

The Clean Air Act requires each implementation plan to “contain such emission limits, schedules of compliance and other measures as may be *necessary to make reasonable progress*.”⁷ Thus, because the 2015 monitoring data indicates that Arkansas has already achieved the FIP’s reasonable progress goals without additional controls, the controls placed on Independence are not necessary. Additional controls simply cannot be necessary to achieve an amount of progress that has already occurred. The EPA exceeds its statutory authority by including controls on Independence despite evidence that such requirements are necessary to make reasonable progress.

Given the current visibility conditions and final reasonable progress goals, the EPA’s methodology may not accurately predict the visibility improvement

⁷ 42 U.S.C. § 7491 (emphasis added).

resulting from the installation of those controls on Independence even though these controls are purportedly required to meet those reasonable progress goals. EPA used the CALPUFF model to predict the visibility improvement. The EPA's CALPUFF results overstate the visibility improvements to be obtained by reductions in SO_x and NO_x emissions. The margins of error show that the calculations by CALPUFF are sufficiently unreliable to decide whether the controls result in visibility improvement. In Appendix A attached to this petition, the ADEQ includes Comments on the Use of the CALPUFF Model.

b. The EPA should reconsider compliance with the Transport Rule as an alternative acceptable method of compliance with BART for NO_x as a result of a recent rulemaking that increased the stringency of the Transport Rule.

The ADEQ requests that the EPA reconsider NO_x limitations placed on BART-eligible facilities and determine that compliance with the Transport Rule⁸ is acceptable for compliance with NO_x BART. The implementing regulations for the regional haze program allow the State to consider compliance with the Transport Rule as an alternative to controls on BART-eligible facilities.⁹ As this option is available to the states, the EPA should also include this BART-alternative in the Regional Haze FIP for NO_x controls.

This request is particularly compelling in light of the recent update to the Transport Rule because the revised NO_x budget for Arkansas is now lower than it was when the "better than BART" regulation was initially promulgated. However,

⁸ Also known as the Cross-State Air Pollution Rule, or "CSAPR."

⁹ 40 C.F.R. 51.308(e).

it was impracticable for the ADEQ to raise this issue before the end of the comment period because the final rule regarding Transport Rule NO_x budgets was not published until October 26, 2016.¹⁰ As discussed below, this issue is of central relevance to the outcome of EPA's decision in Arkansas's Regional Haze FIP and would likely lead to a different outcome in the rule; therefore, the EPA should open a proceeding to reconsider this issue.

In a letter to the ADEQ dated October 13, 2016, the EPA indicates that it will most likely consider compliance with the Transport Rule as a viable alternative for NO_x under the Regional Haze Rule and will issue a national rule to that effect.¹¹ However, the EPA is not required to wait until an updated national rule goes into effect; the current rule allowing compliance with the Transport Rule as a BART-alternative is still in effect and has withstood legal scrutiny. Indeed, the Eighth Circuit Court of Appeals has upheld the EPA's reliance on this alternative.¹² In *National Parks*, the court found that it was not an abuse of discretion for the EPA to rely on its expertise and determine that compliance with the Transport Rule met the requirements of the regional haze program.¹³ The court agreed with the D.C. Circuit that reliance on BART-alternatives is measured on their ability to ensure

¹⁰ 81 Fed. Reg. 74504 (Oct. 26, 2016).

¹¹ The letter from EPA is attached as Appendix B to this petition.

¹² *National Parks Conservation Ass'n. v. McCarthy*, 816 F.3d 989 (8th Cir. 2016) ("*National Parks*").

¹³ *Id.* at 996.

“reasonable progress.”¹⁴ As stated above, recent monitoring data show that Arkansas is meeting the reasonable progress goals set by the EPA and will continue to do so for the rest of the first compliance period.

Allowing facilities subject to the Transport Rule to comply with that rule in satisfaction of NO_x controls for BART in Arkansas will not sacrifice stringency. The EPA has already determined that the Transport Rule—also known as the Cross-State Air Pollution Rule (“CSAPR”)—is “better than BART.”¹⁵ According to the EPA, the Transport Rule achieves “greater reasonable progress towards the national goal of achieving natural visibility conditions in Class I areas than source-specific...BART in those states covered by the Transport Rule.”¹⁶ The EPA recently finalized a rulemaking which updated the Transport Rule, entitled the CSAPR Update Rule.¹⁷ The CSAPR Update Rule provides a small and more stringent NO_x trading budget than the original CSAPR trading program that the EPA considered to be “better than BART.”

If compliance with the earlier CSAPR trading program in Arkansas achieved greater reasonable progress than BART for NO_x, then the CSAPR Update Rule

¹⁴ *Id.* at 995, citing *Utility Air Regulatory Group v. EPA*, 471 F.3d 1333, 1341 (D.C. Cir. 2006), which reviewed the earlier version of the Transport Rule, the Clean Air Interstate Rule (“CAIR”).

¹⁵ Regional Haze: Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, 77 Fed. Reg. 33,642, 33,648 (June 7, 2012) (“Better than BART Rule”).

¹⁶ *Id.* at 33,643.

¹⁷ Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS, 81 Fed Reg. 74504 (Oct. 26, 2016)

must also achieve greater NO_x emissions reductions than necessary for NO_x for BART because the updated NO_x budgets are reduced and more stringent.¹⁸

Thus, based on previous determinations of the EPA, judicial precedent and the increased stringency of the Transport Rule, the agency should open a proceeding to reconsider compliance with the Transport Rule as an acceptable BART-alternative in a program-specific manner for Arkansas. More specifically, the EPA should consider both the original Transport Rule and the CSAPR Update Rule as acceptable methods of compliance with BART for NO_x.

c. The EPA should reconsider the use of low-sulfur coal as BART for SO₂ for White Bluff in light of its recent letter requesting additional information on BART determinations after the close of the comment period.

Since the Regional Haze FIP was published, the EPA authored a letter dated October 13, 2016, which calls into question the agency's decision not to analyze other available control technologies - including existing control technologies - in its BART determinations for the White Bluff and Flint Creek facilities.¹⁹ BART determinations are a central mechanism by which controls are required under the Regional Haze program for this planning period. As a result, the SO₂ BART determination for White Bluff is central to the Regional Haze FIP and, therefore, reconsideration is appropriate.

¹⁸ Compare 81 Fed. Reg. 74504 at 74508 (showing a "12,048" 2017 ozone season NO_x trading budget and "9,210" NO_x trading budget for 2018 and thereafter) with 40 CFR 97.340 (showing a "11,515" 2009-2014 ozone season NO_x trading budget and "9,597" budget for 2015 and thereafter).

¹⁹ See Appendix B.

In its letter of October 13, 2016, the EPA addresses its “preliminary views on supplemental comments regarding a proposed alternative strategy for their White Bluff facility.”²⁰ The letter sets forth the EPA’s official position on additional information necessary to address a five factor analysis for White Bluff based on Entergy’s comments. Among the information requested, the EPA asks for an “Evaluation of DSI as Interim Control.” The EPA appropriately points out that the “BART guidelines require that a subject-to-BART source install and operate the best available emission reduction technology based on the five statutory factors” and states that “it is necessary to consider whether there are additional SO₂ control measures [for White Bluff]. . . that constitute BART.”²¹ Although the EPA’s request is regarding a specific proposal outside of the comment period, the EPA’s position that Arkansas must perform an additional analysis needed for controls that were not considered by the EPA, calls into question whether the EPA, which steps into the shoes of the state, was also legally required to perform a wider range of analysis of possible emissions controls for its own SO₂ BART determination for White Bluff. The EPA’s request for additional information related to SO₂ controls for White Bluff outside of the comment period should necessitate the reconsideration of low-sulfur coal as BART.

In particular, this new information about the EPA’s position on SO₂ for White Bluff should lead the EPA to reconsider other options that include the EPA’s stated criteria for possible controls for SO₂ for White Bluff including having “a relatively

²⁰ See Appendix B at 1.

²¹ *Id.* at 2.

low capital cost” and whether the controls would “be effective if operated for a short period of time,” which is appropriate due to the short remaining time in the first planning period.

The ADEQ requests the EPA reconsider its SO₂ BART determination for White Bluff and include an analysis for controls that would also have a “low capital cost” and would be effective “for a short period of time” – the use of low sulfur content coal tied to an appropriate corresponding emission rate. The ADEQ urges the EPA to undertake a thorough reconsideration of low sulfur content coal using the five factors resulting in a determination of that emission control as BART. In Appendix D attached to this petition, the ADEQ includes considerations for a five-factor analysis that supports a BART determination for low-sulfur coal when taking into consideration the remaining time in this planning period, as well as certain errors in the EPA’s BART determination for White Bluff.

III. Basis for Immediate Administrative Stay

a. The request meets the standard for an administrative stay.

The EPA Administrator is authorized to stay the effective date of its actions “when justice so requires.”²² The Administrator makes this determination by considering the same factors applied to a request for judicial stay. Those factors are: 1) whether the petitioner is likely to prevail on the merits of the appeal; 2) whether the petitioner is likely to suffer irreparable harm in the absence of a stay; 3) whether it is in the public interest to stay the rule; and 4) whether a stay will

²² 5 U.S.C. § 705.

cause harm to other parties. As proven by the analysis below, justice compels the Administrator to stay the Regional Haze FIP.

b. The State is likely to succeed on the merits of a challenge to the Regional Haze FIP.

Much of the Regional Haze FIP is arbitrary, capricious and without a basis in the law and the State has a strong likelihood of success on the merits of a challenge. The ADEQ does not waive any arguments not raised in this section. The following is not an exhaustive list of the legal flaws in the Regional Haze FIP but, rather, an example of some of the most glaring errors in the rule.

1. The EPA is arbitrary, capricious and without a basis in the law in applying emissions controls to BART-eligible facilities. Some of the emissions controls will not be implemented until after the end of the first planning period²³, a requirement that was questioned by the Fifth Circuit in reviewing a stay request for the Texas Regional Haze FIP.²⁴ In addition, the EPA reduces the time for compliance for other controls without any basis in the record.²⁵
2. The EPA ignored the fact that Arkansas is below the Uniform Rate of Progress (“URP”) in meeting background visibility by 2064. EPA does not explain why it chose to ignore the facts and insisted additional controls were necessary to achieve “reasonable progress.” In combination with the IMPROVE monitoring data discussed above, the ADEQ is very likely to succeed in arguing that additional controls are not necessary to achieve reasonable progress toward background visibility.
3. The EPA has not justified the alleged benefits of the Regional Haze FIP in relation to the costs of compliance. The data in the record demonstrate that the required controls offer no appreciable visibility improvement. Without perceptible visibility improvement,

²³ For example, compliance with SO₂ controls for White Bluff Units 1 and 2 must be met three (3) years after the effective date of the rule, which will be after the end of the first planning period in 2018. See 81 Fed. Reg. 66332, 66335 (Sept. 27, 2016).

²⁴ *Texas v. EPA*, 829 F.3d 405, 429-30 (5th Cir. 2016)

²⁵ See 81 Fed. Reg. 66332, 66342 (Sept. 27, 2016).

the EPA cannot justify the significant costs of compliance – costs that will be passed on to electric ratepayers in Arkansas. The EPA clearly ignores the Supreme Court’s ruling in *Michigan v. EPA*²⁶.

c. An administrative stay will prevent irreparable harm to ratepayers of Arkansas and is in the public interest.

Without an administrative stay of the Regional Haze FIP, the rule will mandate controls that are both unnecessary and costly, imposing billions of dollars in total economic costs without the requisite evaluation of the impact of the controls on visibility improvement in Class I federal areas.

Implementation of the rule as written will inflict irreparable harm upon the Arkansas ratepayers who will ultimately pay for the controls required by the facilities regulated by the rule under the FIP. Entergy Arkansas filed comments estimating that the installation of scrubbers on Independence and White Bluff will cost roughly \$1 billion each.²⁷ Under Arkansas law, the capital costs such as those for installation of emissions controls required by federal law may be passed on to ratepayers.²⁸

The public interest favors the granting of stay because Arkansas has already achieved the reasonable progress goal for this period and excess controls would not further the purpose of the regional haze program. The Regional Haze program grants the EPA the authority to promulgate regulations, including FIPs, that

²⁶ 576 U.S. ___, 135 S.Ct. 2699 (2015).

²⁷ See Entergy comments of August 7, 2015 at p.4; Exhibit B (For White Bluff, the “total capital investment to install dry [scrubbers] was estimated to be “\$1,072,370,000.”), found at <https://www.regulations.gov/document?D=EPA-R06-OAR-2015-0189-0166>.

²⁸ See Ark. Code Ann. § 23-4-501 *et seq.*

“contain such emission limits, schedules of compliance and other measures as may be *necessary to make reasonable progress*.”²⁹ As has been demonstrated by the recent IMPROVE monitoring data, the EPA has no legal basis for mandating additional controls because reasonable progress, as measured by the reasonable progress goals for this planning period, has already been achieved. Therefore, the imposition of emissions controls in excess of this statutory authority are unnecessary and will burden the state’s ratepayers with costs passed on from impacted utilities for the installation of controls that are wholly without a basis in law or fact. It is in the public interest to stay the rulemaking because the high costs of the FIP would unduly burden Arkansas ratepayers without providing an appreciable benefit and in a manner that exceeds the EPA’s authority under the Clean Air Act.

d. An administrative stay will not cause harm to other parties.

A stay of the Regional Haze FIP will not cause harm to the EPA or other parties. As stated above, Arkansas is currently making reasonable progress toward background visibility conditions in its two Class I Federal areas—without any additional controls. Additionally, this progress is projected to continue through 2018 and likely beyond. An administrative stay of the Regional Haze FIP will not slow this progress and will not negatively impact visibility within Class I Federal areas affected by Arkansas sources.

²⁹ 42 U.S.C. § 7491.

IV. Conclusion

For the foregoing reasons, the EPA should open a proceeding to reconsider its decision regarding the Arkansas Regional Haze FIP and should immediately stay the rule.

Date: November 22, 2016

Respectfully submitted by:

/s/ Jamie L. Ewing

On behalf of

Arkansas Dept. of Environmental Quality
Becky Keogh, Director
5301 Northshore Drive
North Little Rock, AR 72118

Jamie L. Ewing
Assistant Attorney General
Office of Attorney General Leslie Rutledge
323 Center Street, Suite 200
Little Rock, AR 72201
(501) 682-5310
jamie.ewing@arkansasag.gov

Appendix A

Comments on the Use of the CALPUFF Model in the US Environmental Protection Agency's Federal Implementation Plan for the Regional Haze Rule in Arkansas

Prepared by:

Gale F Hoffnagle, CCM, QEP

TRC Environmental Consultants

November 18, 2016

INTRODUCTION

The focus of these comments is on the scientific support for US Environmental Protection Agency's (EPA) reliance on small changes in CALPUFF visibility model calculations and results to make policy decisions related to sulfur oxides (SO_x) and nitrogen oxides (NO_x) emissions controls necessary to reduce visibility impacts on Class I areas in Arkansas. EPA contends in its proposed Federal Implementation Plan (FIP) that modeled visibility improvement numbers on the order of or less than 1 deciview down to 0.002 deciviews in the modeling analysis are sufficient to impose additional controls on power plant units. However, EPA (at Page 2009 of the proposed Utah FIP), admits that *"most people can detect a change in visibility at one dv (deciview)"*.

These comments are meant to challenge the scientific integrity of EPA assertions and calculations in the final FIP regarding the CALPUFF-modeled visibility improvement analyses.

MARGIN OF ERROR

Inert Transport

Knowing the range of error for a CALPUFF modeled dv result is important in understanding the relevance of the results. For instance, if CALPUFF says that the visibility will improve by 0.085 dv, what is the range (margin) of error in that model result? Could the range be 0.2 dv to -0.1 dv (no improvement)? To understand how faithfully CALPUFF reproduces actual

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results we must look to the field experiments comparing CALPUFF³ (version 5.8 as used by EPA) to measured results. The most comprehensive comparisons of CALPUFF with long range transports experiments was prepared for EPA¹ in 2012.

The margin of error is technically determined by multiplying the central value by the standard deviation of multiple values at some confidence level. It is expected that the central value of the measured data and the central value of the modeled results are the same and that the range of modeled error can reasonably be determined by a simple formula. What is immediately apparent by looking through the experiments is that CALPUFF is always biased high using the CALPUFF version (2005, Version 5.8.4) which is cited in the BART Guidelines and used rigorously by EPA in all the BART SIP/FIP work. The studies are presented in Attachment A. There are two issues to contend with, the bias and the margin of error.

A summary table of the EPA¹ results has been prepared:

Table 1: CALPUFF Mean Normalized Bias and Normalized Mean Square Error

Comparisons to Field Studies				
		Maximum Observed Percent MNB/NMSE		Centerline Percent MNB
		MNB	NMSE	
Great Plains				
	100 km,	84%		65%
	600 km.	-75%		-76%
Savannah River				
	100 km.	71%		221%
CAPTEX				
	all receptors 100-1000 km.		41%	
ETEX				
	all receptors 50-1400 km.		320%	

Details of the studies and the results presented in Table 1 are contained in Attachment A.

In summary, all of these comparisons to field experiments show is that CALPUFF has a bias for over predicting maximum concentrations which is at least 71% and a margin of error of

at least 41% around that bias central value. So, as an example, if CALPUFF estimated a visibility reduction of 0.085 Dv, then it is likely that the actual the margin of error is between 0.085 to - 0.085 Dv. There is thus the opportunity in the margin of error that the change in Deciviews is imperceptible. The better expression is in Inverse Megameters (Mm^{-1}), because the total extinction goes from 23.05 Mm^{-1} to a range from 19.01 to 9.56 Mm^{-1} .

Table 2: Example Calculation of the Margin of Error

	98% Modeled		Correct for Bias (71%)		Margin of Error (Mm^{-1})		Margin of Error (Dv)	
	Mm-1	Dv	Mm-1	Dv	+41%	-41%	+41%	-41%
Without Control	23.250	8.437	13.596	3.072	19.171	9.643	6.508	-0.364
With Control	23.053	8.352	13.481	2.987	19.009	9.561	6.423	-0.449
Difference	0.197	0.085	0.115	0.085	0.162	0.082	0.085	-0.085

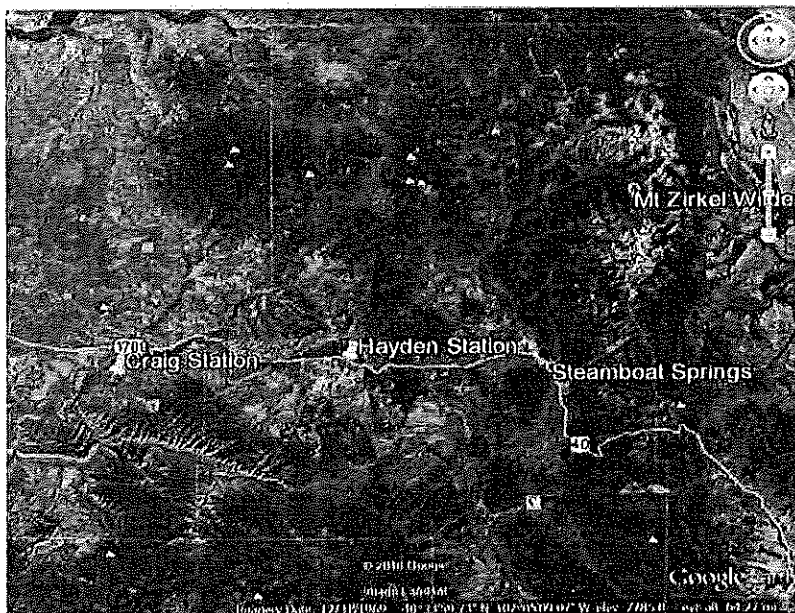
But, all of these evaluations of CALPUFF against field data are from experiments with chemically inert tracers. There was little to no atmospheric chemistry occurring in any of these experiments. So it only reveals the margin of error associated with getting the molecule of SOx or NOx to the Class I area, not whether it is now a sulfate or nitrate.

Atmospheric Chemistry

To address the margin of error associated with the modeling of the atmospheric chemistry involved in the visibility calculation, comparisons of the modeled visibility versus the measured visibility must be used. This relatively straightforward comparison has not been used by EPA in any of the BART actions which they have undertaken. EPA simply states that the Guidance requires the use of the 2005 version of CALPUFF and that its answers can be relied upon to make decisions regarding BART controls and the visibility improvements are *reasonably anticipated*.

In visibility modeling measured versus modeled comparisons should use the IMPROVE ² measured data. On every third day IMPROVE measures the particulate matter which causes visibility impairment and calculates the total extinction and the portions of that extinction due to many types of particles, most especially including nitrates. Nitrate chemistry is the most important to the BART process because in almost every case EPA insists on requiring NO_x reduction through control technology. Because the modeling requires making a daily 24-hour average estimation there is a one-to-one correlation of measured and modeled on every third day. There is, arguably, some offset for travel time from source to park and this occurs around midnight each day. An example which has been studied extensively ³ is two coal fired power plants which are less than 100 kilometers west of the Mt. Zirkel Wilderness Area in Colorado. Figure 1 shows the geographic situation.

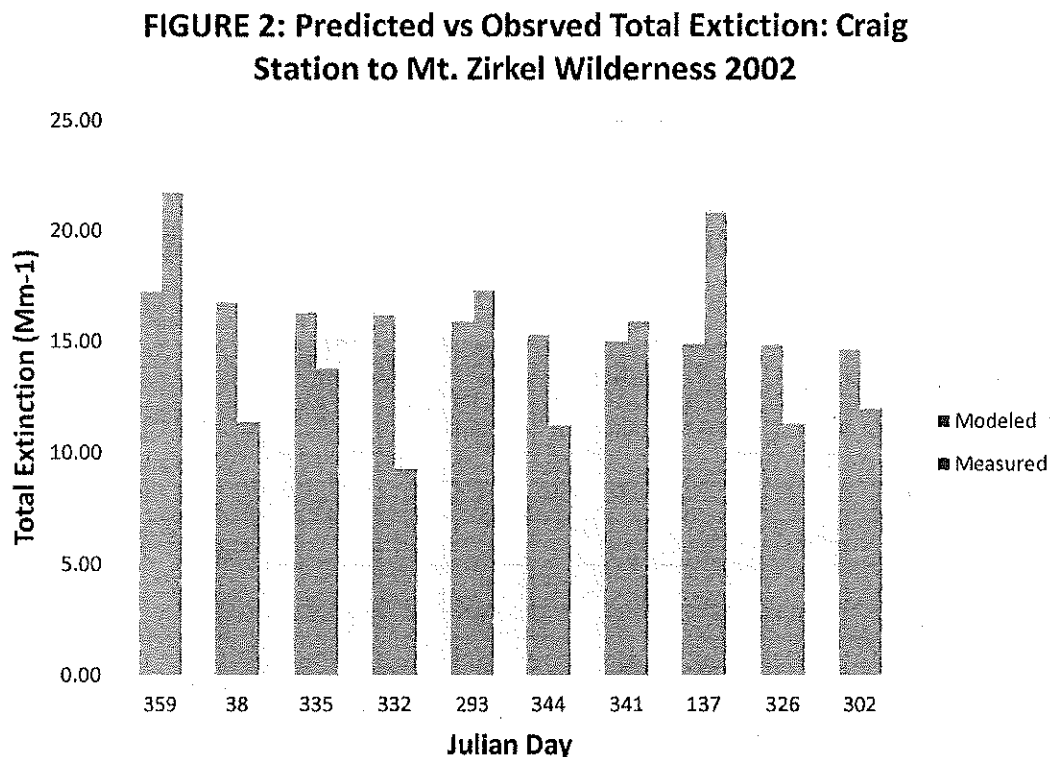
FIGURE 1: Geographic Layout between Power Plants and Mt. Zirkel



Craig Station is approximately 83 kilometers from the Mt. Zirkel IMPROVE site and Hayden Station is approximately 50 kilometers away in nearly the same direction where it is

anticipated that both facilities would impact on some of the same days. EPA, by the way, almost never models the impacts of multiple facilities when determining BART.

Because the wind doesn't always blow from the WSW direction, the comparison should be made on the worst case days of modeled impact at Mt. Zirkel. Using modeling produced by Colorado ⁴ the 25 worst case modeled days were matched with days of measured data at Mt. Zirkel resulting in 10 days in 2002. Figure 2 shows a comparison of total extinction for those 10 days when the only modeled contributor to visibility extinction is Craig Station.



Note: This has been revised based on the analysis of previous results in Docket EPA-R06-OAR-2015-0189-0222

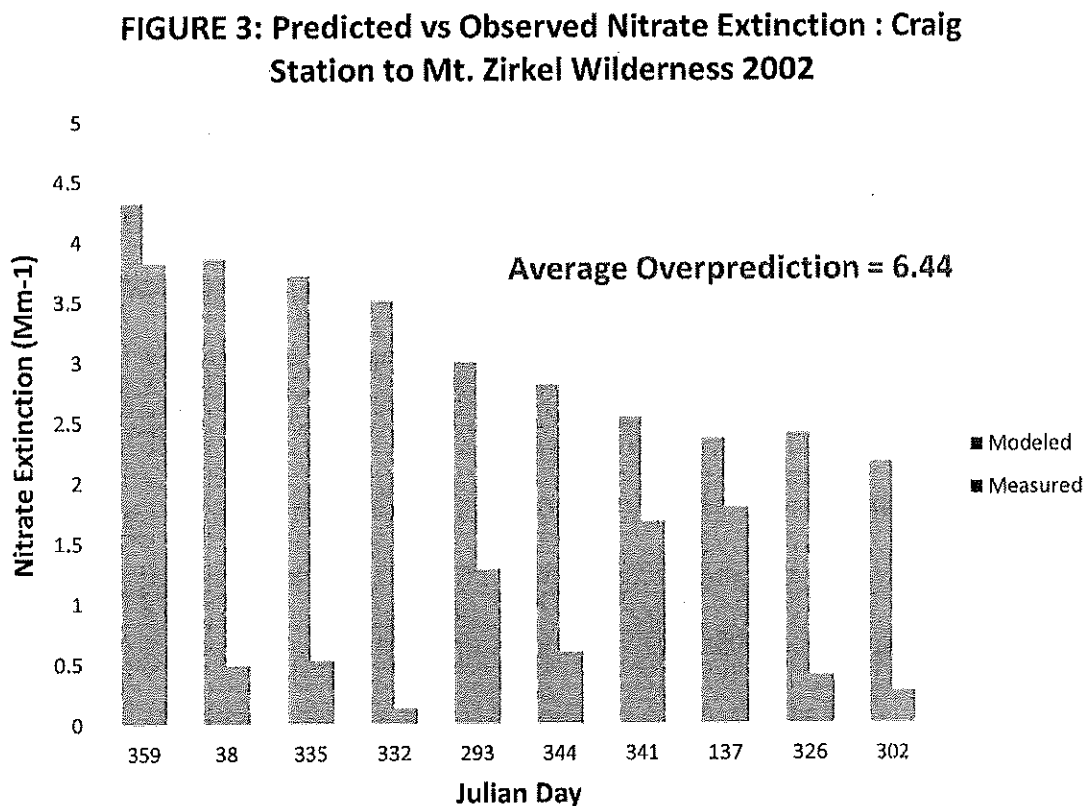
The modeled results exceed the observed in Figure 2 by 17% (the bias) and the margin of error is 38%. That result assumes that Craig Station is the only contributor to extinction at Mt. Zirkel, which clearly is not true. When Hayden Station is added to the evaluation, the modeled exceeds the observed by 61% (the bias) and the margin of error is 132%. There are, of course,

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other power plants and oil and gas sources in the area that contribute to the measured data which are not accounted for in the model and thus the over prediction and margin of error are actually greater.

The results for total extinction are somewhat in line with the margin of error for non-reactive comparisons made above. That is, over predictions on the order of 71%.

The issues in the BART SIP/FIP debates are, however, the prediction of nitrate extinction due to NO_x emissions which EPA seeks to control. Because the model calculates and the IMPROVE data measures nitrates at the parks, a comparison can be made of the nitrate calculation margin of error. Starting again with Craig Station only, the comparison is shown in Figure 3:



Note: This has been revised based on the analysis of previous results in Docket EPA-R06-OAR-2015-0189-0222

Again, this is the subset of the top 10 modeled days for which there is a measurement at Mt. Zirkel versus the modeled nitrate extinction from Craig Station only. The average over prediction (the bias) is 6.44 times the measured extinction, not just 71%. The margin of error grows to 45.5 times the value. This implies that the model is consistently making far more nitrates than are actually measured and has no reasonable ability to predict nitrate concentrations. If Hayden Station is added, the over prediction (the bias) goes to 14.3 times the actual measured.

The reason for the models over prediction is obvious to many atmospheric chemists. EPA insists that the ammonia be set to 1 ppb, no matter the time of year. Almost all of the occurrences of high extinction due to the power plants occur in the winter when ammonia concentrations in the atmosphere are low. There is one exception (May 16, Julian day 137). When the atmosphere is cold enough to make nitrates from NO_x, there is little ammonia available to do so in the winter months. Also, SO_x in the plumes preferentially uses the ammonia. EPA has insisted that background ammonia concentrations be kept at 1 ppb throughout the year and be available to every NO_x or SO_x molecule that is modeled. The use of an annual concentration for ammonia is curious since many measurements of ambient air ammonia show concentrations in the range of 0.1 ppb in the winter months and EPA uses monthly average concentrations of water vapor and hourly measures of ozone in its modeling.

Summary

The bias for the use of the 2005 version of CALPUFF in evaluating concentrations and thus extinction in National Parks and Wilderness Areas is on the order of 71% over prediction (the bias) for atmospheric dispersion process and at least a factor of 6.44 times actual extinction (the bias) for winter time nitrate formation from emission sources. The margin of error is 41%

for the inert transport and 37% for total extinction. For nitrates specifically the margin of error is 45 times the value.

Comparing Model Results and Applying the Margin of Error

In rejecting Arkansas's BART SIP, EPA chose to add the Independence Power Plant to the facilities needing controls. EPA primarily relies on just one model result to test the results of its controls, the 98% of potential visibility impacts in the Parks. That means the impacts on just 7.3 days (8th highest impact day). This, of course is the most stringent test and is not derived from the focus of the BART rule on the best 20% of days and the worst 20% of days.

The Independence Plant is 180 kilometers from the Upper Buffalo Wilderness Area and 277 kilometers from Caney Creek Wilderness Area. Referring again to the tracer studies on the transport and dispersion of CALPUFF 5.8 shown in Table 1, the bias and margin of error for the model at these distances is substantially worse than it is at 100 kilometers. Technically the bias and margin of error are larger at these distances and the EPA deciview results are even less reliable.

For the Arkansas FIP EPA CALPUFF model results⁵ for the Independence Plant, Table 3 shows the effect of considering the transport/diffusion margin of error assuming the calculation is at 100 kilometers. The reductions in predicted deciviews account only for the bias and margin of error in the transport and diffusion of gases to the Wilderness Areas and do not account for the errors in atmospheric chemistry.

Table 3: Apply Transport and Diffusion Margin of Error to EPA Independence Results
(EPA final Rule Table 14)

Final Rule	Model Predicted Baseline		With FGDD		FGDD Improvement	
	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney Creek	12.86	2.51	11.52	1.42	1.33	1.10
Upper Buffalo	12.54	2.26	11.15	1.09	1.39	1.18

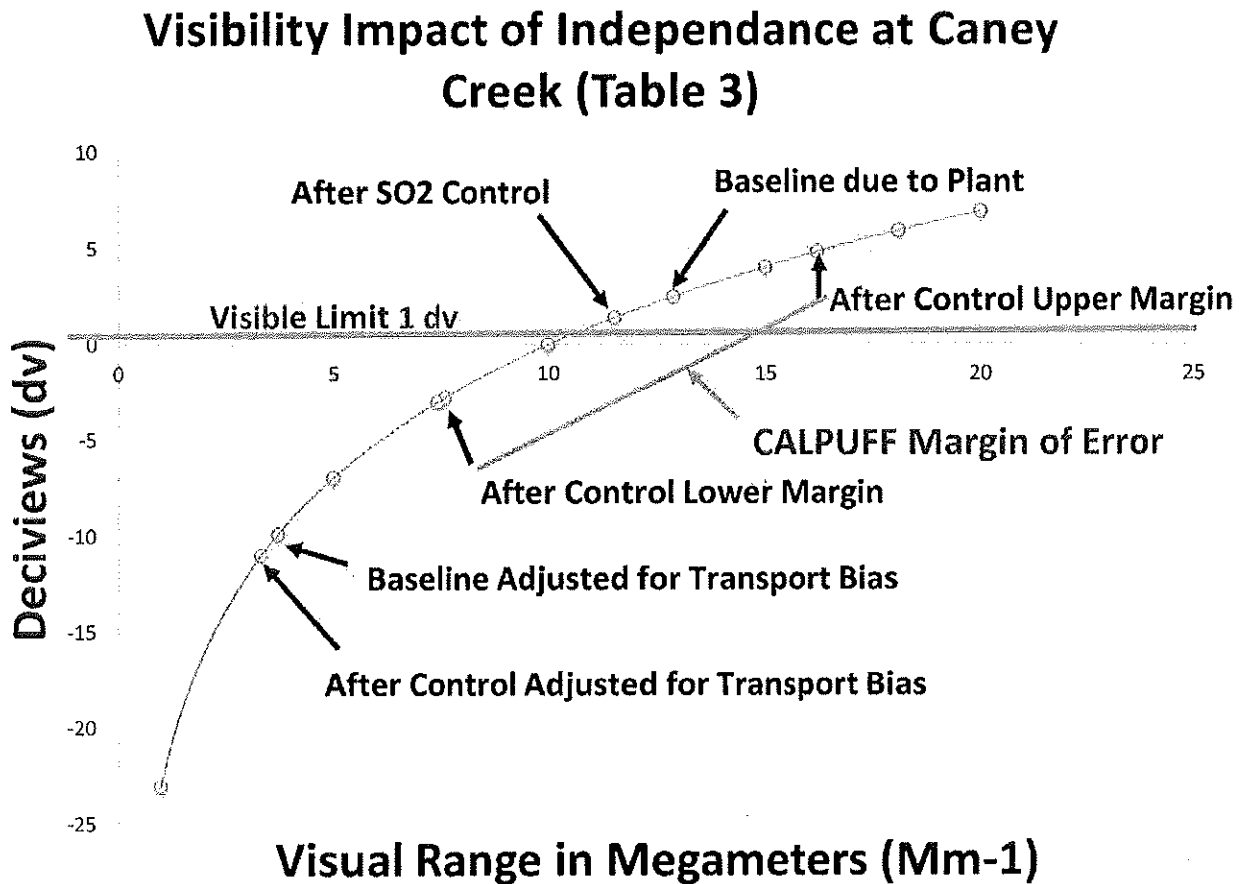
Subtract Bias of 71%						
Bias	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney Creek	3.73	-9.87	3.34	-10.96	0.39	not visible
Upper Buffalo	3.64	10.11	3.23	-11.29	0.40	not visible
Margin of Error of +41%						
Plus Margin	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney Creek	18.13	5.95	16.24	4.85	1.88	1.10
Upper Buffalo	17.68	5.70	15.72	4.52	1.96	1.18
Margin of Error of -41%						
Minus Margin	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney Creek	7.58	-2.76	6.80	-3.86	0.79	not visible
Upper Buffalo	7.40	-3.01	6.58	-4.19	0.82	not visible

Table 3 shows the EPA Table 14 results in the first set labeled **Final Rule**. It shows EPA's calculation of visibility improvement of 1.1 and 1.18 deciviews when using a dry FGD. I have used two significant figures to the right of the decimal point, but even that is more places than valid by the calculation error. The second set of calculations is an evaluation using the bias of CALPUFF and is labeled **Bias**. This shows that bias brings the calculation of an impact of both the base case impact on the Wilderness Areas to well below zero deciviews and no visually perceptible impact. In order to show the margin of error issue, I will ignore for the moment that the bias takes the calculation of any visible impact. The third set is applying the margin of error on the plus side and is labeled **Plus Margin**. The plus margin results in impacts of 4.85 and 4.52 Mm-1 of extinction. The last set is the negative margin and is labeled **Minus Margin**. It shows

that the margin of error includes no visible impact at all. When the change in visibility is too small (below zero dv) it is labeled “not visible”.

To aid in visualizing the results in Table 3 they are reproduced in Figure 4.

FIGURE 4: Presentation of the Results in Table 3



The Table 3 results show that correcting for dispersion and transport bias would result in no visibility impact from the Independence Plant. The Table 3 results show that utilizing the transport and diffusion margin of error (without accounting for the bias), the EPA CALPUFF model results show too large a margin of error to conclude that that requiring dry FGD on the

Independence Plant would assure an improvement in visibility. The margin of error is from 4.85 Mm-1 to not visible at all.

The bias and margin of error for the EPA CALPUFF modeling for Independence Plant for the effectiveness of NOx controls is related to the formation of nitrates from the emissions of NOx. The results can be evaluated in the same way. EPA has chosen, in order to maximize the effect of reductions in NOx emissions to use a different baseline for calculation of the controls benefit. This is highly unusual since it then changes the dates, times and locations of the 98% frequency of impact on the Class I areas. Because of this change I have had to re-evaluate the transport and diffusion errors before adding the atmospheric chemistry errors. These results are presented in Table 4.

Table 4 demonstrates that when you consider the transport and diffusion bias to the EPA calculated NOx control analysis all results fail to have a visible impact. The atmospheric chemistry bias for total emissions and for nitrate emissions discussed above are applied separately at that line in the Table.

Table 4: Apply Transport, Diffusion and Atmospheric Chemistry Margin of Error to EPA Results (EPA Final Rule Table 15)

Final Rule	Model Predicted Baseline		With NOx Controls		NOx Improvement	
	Δ Mm-1	Δ dv	Δ Mm-1	Δ dv	Δ Mm-1	Δ dv
Caney Creek	12.25	2.03	11.70	1.57	0.55	0.46
Upper Buffalo	12.22	2.00	11.98	1.81	0.24	0.20
Transport Bias and Margin						
Plus Margin	Δ Mm-1	Δ dv	Δ Mm-1	Δ dv	Δ Mm-1	Δ dv
Caney Creek	5.01	-6.91	4.78	-7.37	0.22	not visible
Upper Buffalo	5.00	-6.94	4.90	-7.14	0.10	not visible

Minus Margin	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney						
Creek	3.55	-10.35	3.39	-10.81	0.16	not visible
Upper						
Buffalo	3.54	-10.38	3.47	-10.57	0.07	not visible
	Bias of 17%			Bias of 6.44		
Chem Bias	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney						
Creek	10.17	0.16	9.71	-0.29	0.09	not visible
Upper						
Buffalo	10.14	0.14	9.94	-0.06	0.04	not visible
	Chem + Trans					
Chem + Trans	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv	$\Delta Mm-1$	Δdv
Caney						
Creek	3.55	-10.35	3.39	-10.81	0.02	not visible
Upper						
Buffalo	3.54	-10.38	3.47	-10.57	0.01	not visible

Other Evidence

The most compelling evidence of the bias and margin of error would come from a direct comparison of the modeled results to actual measurements at the Class I areas. It is a sign of the unscientific approach to visibility which EPA has undertaken that they never compare their model predictions to measured data. The IMPROVE network has been taking measurements of the nitrates and sulfates at many Class I areas including the Caney Creek Wilderness Area and Upper Buffalo Wilderness Area for decades, including the years 2001, 2002 and 2003 which are the subject of the modeling. The measurements are 24 hour averages, just like the model results and so one-to-one comparisons can be made. It should be noted that the IMPROVE margin of error is on the order of 3% for the equation they developed to calculate deciviews from measured particulate concentrations. It is beyond scientific understanding why EPA does not do or require this analysis model comparison analysis in the BART process.

Fortunately for this Arkansas case, this kind of measured to model comparison has been done. Trinity Consultants⁶ prepared for EAI the model results at the Lake Catherine Plant. Caney Creek is approximately about 100 kilometers west of Lake Catherine (the ideal distance for the margin of error derived above) and approximately 160 kilometers southeast of Upper Buffalo. The comparisons are shown on Trinity Figures 4-1 through 4-6 of the report and show that the Lake Catherine Plant makes infinitesimal contributions to the 20% worst case days at the two Wilderness areas. This is compared to the EPA methodology CALPUFF model results which estimate that Lake Catherine makes average contributions on the 20% worst case days of 28.60 Mm⁻¹ (dv=1.39). The bias is evident and the margin of error is 1.16 dv at Caney Creek and 0.93 at Upper Buffalo.

CONCLUSION

The bias and margins of error for CALPUFF, both the transport and diffusion error and the chemistry error, have been applied to various results of EPA CALPUFF BART modeling for the Arkansas Regional Haze SIP and EPA FIP. The CALPUFF results considering the bias overstates the visibility improvements to be obtained by reductions in SO_x and NO_x emissions. The margins of error show that the calculations by CALPUFF are sufficiently unreliable to decide whether the controls result in visibility improvement. Improvements in visibility for the Independence Plant are not visible once the bias and margin of error of the CALPUFF modeling are taken into account. In addition, predicted improvements are below 1 Dv, the limit of human perceptibility. Adding controls to the Independence Plant will not lead to significant or measureable improvements in visibility in the Wilderness Areas.

REFERENCES

1. US Environmental Protection Agency: "Documentation of the Evaluation of CALPUFF and other Long Range Transport Models using Tracer Experiment Data", prepared by ENVIRON International Corporation, EPA-454/R-12-003, May 2012. Docket EPA-R06-OAR-0189-0215
2. IMPROVE data base: <http://vista.cira.colostate.edu/improve/>
3. Colorado BART Modeling Data Figure 25, page 51 BART CALPUFF Class I Federal Area Individual Source Attribution Visibility Impairment Modeling Analysis for Tri-State Generation & Transmission Association Craig Station Units 1 and 2. Docket EPS-R06-OAR-2015-0189-0244
4. Colorado Air Pollution Control, "BART CALPUFF Class I Federal Area individual Source Attribution Craig Station Units 1 and 2", June 2012.
5. "Summary of Additional Modeling for Entergy Independence", Michael Feldman, Region 6, April 20, 2015. Docket EPA-R06-OAR-2015-0189-0147
6. Trinity Consultants, "Evaluation of the CALPUFF Modeling system Margin of Error for BART Analysis" August 4, 2015. Exhibit H of Entergy Comments of August 7, 2015. Docket EPA-R06-OAR-2015-0189-0153

Attachment A

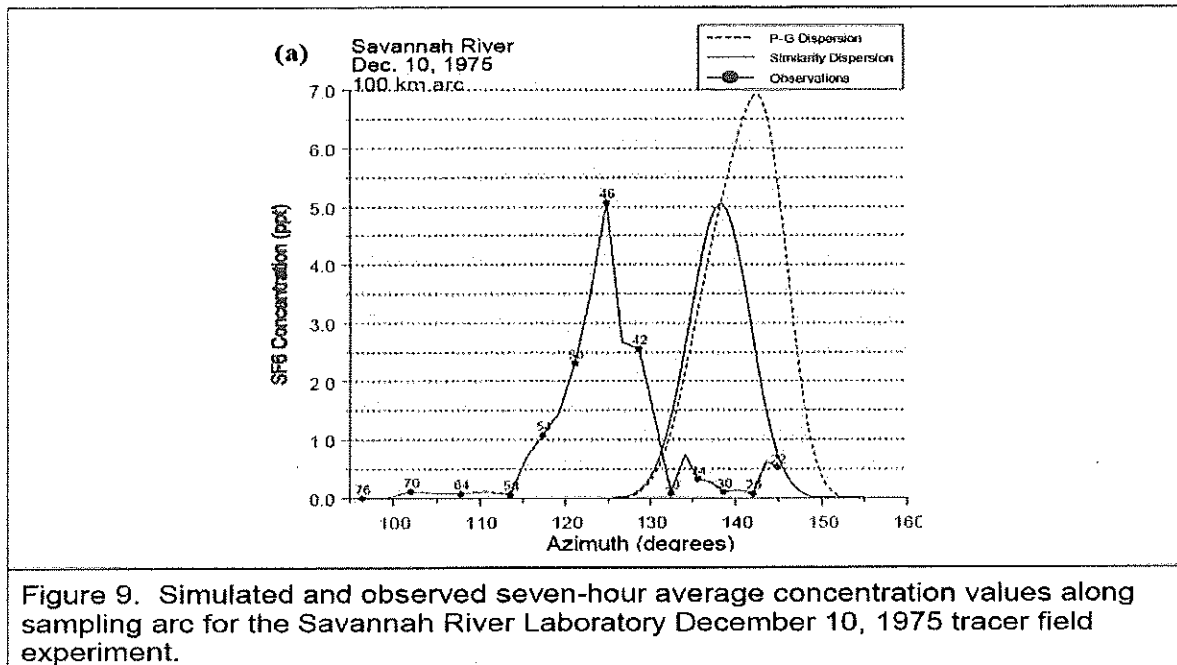
Basis for Adopting CALPUFF in the BART Rules:

The US EPA adopted, in November 9, 2005, changes to the Guideline on Air Quality Models (40 CFR part 51, Appendix W) which identified the modeling system called CALPUFF version 5.8 (originally developed for the California Air Resources Board) as the “preferred” model for Long Range Transport (LRT), i. e. any distance beyond 50 kilometers from the source. Nearly simultaneously, July 9, 2005, EPA finalized the BART Guidance (40 CFR part 51, Appendix Y) which allowed the use of the CALPUFF version 5.8 modeling system in assessing visibility improvements at Class I areas for BART eligible sources. These actions were based on nearly 10 years of work, mostly by the Federal Land Managers, to determine if CALPUFF was appropriate for the analysis.

The basis of these adoptions was comparisons of CALPUFF results to measured data from 4 long range transport (LRT) experiments. Each of these experiments used inert tracers and thus evaluated the transport and diffusion aspects of CALPUFF. The tests were summarized in the report “Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts”, EPA-454/R-98-019, December 1998. EPA also produced a document “A Comparison of CALPUFF Modeling Results to Two Tracer Field Experiments”, EPA-454/R-98-009, June 1998. This document dealt with the Savannah River and Great Plains studies. The outcomes of these model comparisons are as follows:

1. Savannah River Laboratory Tracer Study: A single 6 hour tracer release was measured along an arc of measurement points 100 kilometers from the release. The terrain was flat and heavily wooded so the release was from an elevated tower. The CALPUFF 5.8 result was 35% higher than the measured concentration of the released gas and 20° off in the wind direction and much too narrow a plume.

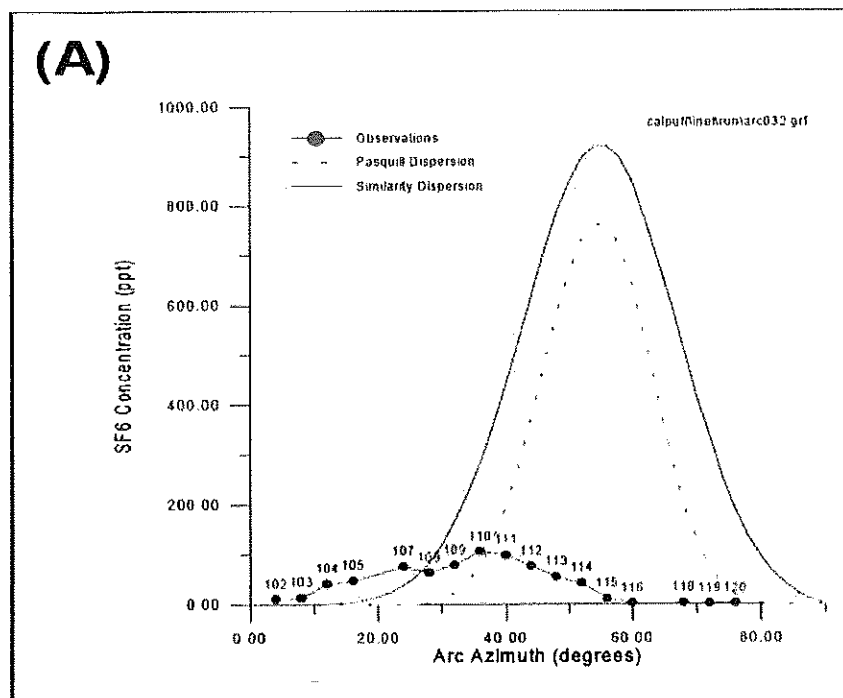
Figure 1: Savannah River Results at 100 Kilometers



Dashed line represents CALPUFF version 5.8 results which require use of P-G dispersion

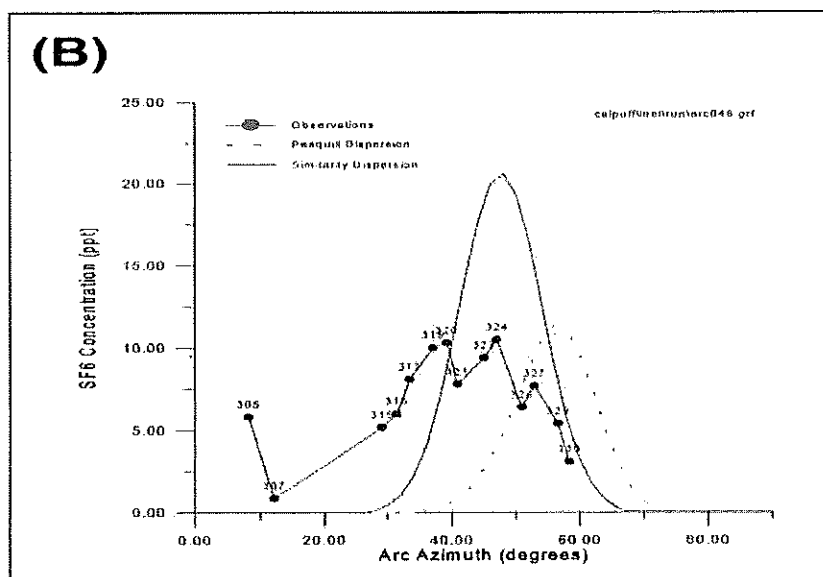
2. Idaho Falls Tracer Study: A single 3 hour release was measured along three sampling arcs at 3, 48 and 90 kilometers. The terrain was flat rangeland.
 - a. At 3 kilometers the CALPUFF 5.8 result was 9 times too high and 10°
 - b. At 48 kilometers the CALPUFF 5.8 result was 10% too high, 20° off in wind direction and much too narrow.
 - c. At 90 kilometers the CALPUFF version 5.8 result was 5% too high and 10° off in wind direction and the width was similar.

Figure 2: Idaho Falls Results at 3 Kilometers



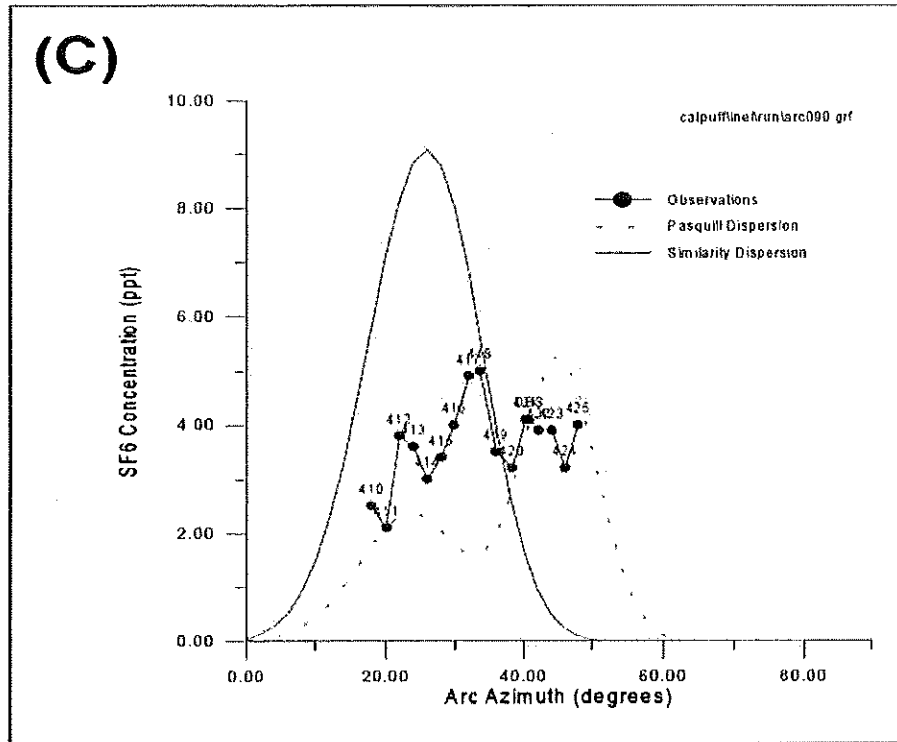
Dashed line represents CALPUFF version 5.8 results which require use of P-G dispersion

Figure 3: Idaho Falls Results at 48 Kilometers



Dashed line represents CALPUFF version 5.8 results which require use of P-G dispersion

Figure 4: Idaho Falls Results at 90 Kilometers



Dashed line represents CALPUFF version 5.8 results which require use of P-G dispersion

3. Great Plains Tracer Study: A 3-4 hour tracer release from near Oklahoma City was measured at distances of 100 and 600 kilometers. The terrain was flat except for the Ozark Mountains.
 - a. At 100 kilometers the CALPUFF version 5.8 result was 2.5 times the measured data, about right in wind direction but narrower than the plume. There was a second test at 100 kilometers where the CALPUFF version 4.8 results were 2.27 times the measured.
 - b. At 600 kilometers the CALPUFF version 5.8 result was 1/3rd of the measured concentrations, 15° off in wind direction and wider than the plume.

Figure 5: Great Plains Results at 100 kilometer (A) and 600 Kilometers (B)

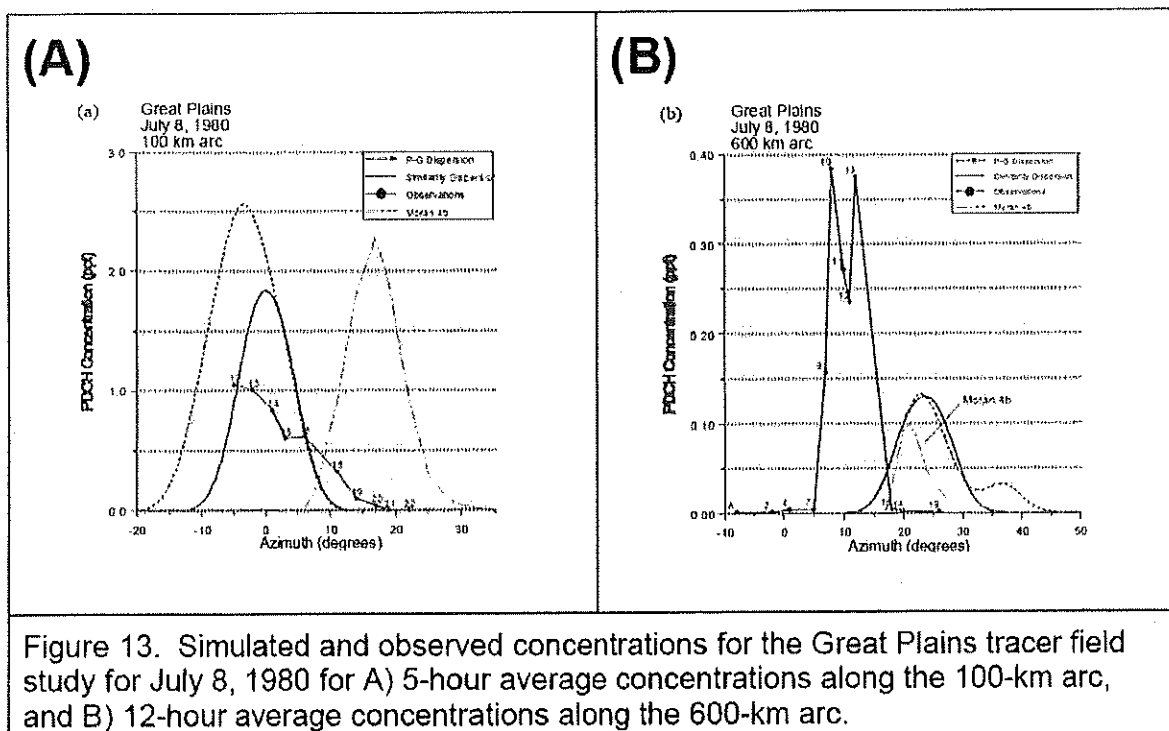
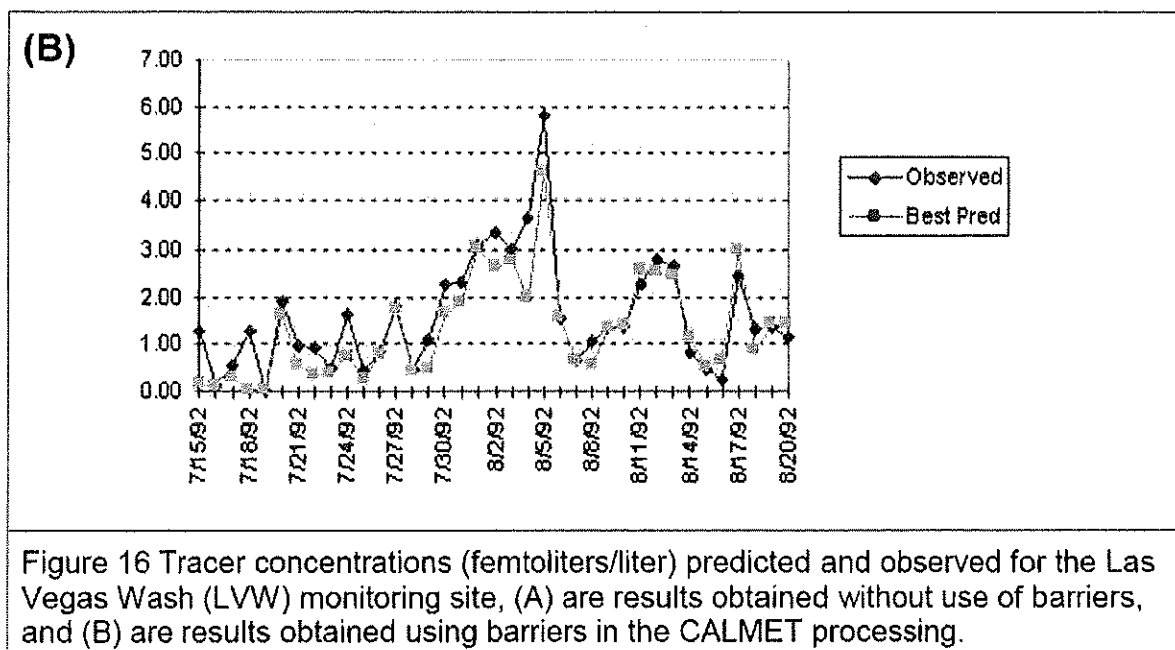


Figure 13. Simulated and observed concentrations for the Great Plains tracer field study for July 8, 1980 for A) 5-hour average concentrations along the 100-km arc, and B) 12-hour average concentrations along the 600-km arc.

Dashed line represents CALPUFF version 5.8 results which require use of P-G dispersion

4. Project Mohave Tracer Study: This is the only long term release study used, it had 31 days of emissions in mid-summer. There were several monitors but not an arc like the other studies. After various artificial changes to the model method, CALPUFF version 5.8 results at a single monitor about 100 kilometers away showed various results but tended to follow the measured data fairly closely.

Figure 6: Project Mohave Results at ~100 Kilometers



These were the four long range transport experiments available for comparison to the CALPUFF version 5.8 at the time of adoption. All these experiments lacked the rigor of a truly useful database for making a model comparison. They also suffer from using inert tracers that do not have any atmospheric chemistry and thus only test the ability of the model to get gases from point A to point B. All but one of these comparisons is on flat terrain and thus unlike Utah. Most importantly, these comparisons are not comparisons for calculating deciviews. Despite all of the issues raised by these studies, the IWAQM conclusion was that

"Comparisons were made of CALPUFF simulated dispersion with near surface concentrations collected during several tracer field studies, where the transport distances were of the order 50 to 300 km. ...The CALPUFF modeling system is recommended in place of the MESOPUFF II modeling system for a number of reasons..... The IWAQM recommends the CALPUFF modeling system for use as a refined long-range transport and dispersion modeling technique for characterizing reasonably attributable pollutant impacts from one or a few sources."

From the accumulated tracer-study results, I could only conclude that at 100 kilometers CALPUFF version 5.8 was 35%, 5% or 250% too high, an average of 96% too high. The mean error rate for all four tests was 96%. At 600 kilometers it vastly underestimated concentrations. The source of the regulatory use of CALPUFF out to 300 kilometers is the offhand statement

cited above and not supported by any of the data in the report. There are comparisons to data at less than 50 kilometers and to other models but none of them tell us anything about the long range transport capabilities of CALPUFF version 5.8.

In addition, as best that could be determined from the Savannah River and Great Plains experiments (Table 2 of EPA-454/R-98-009) at the time there is an error rate of 79% and always greater than the measured concentration. The error rate can be expected to become worse at distances beyond 100 kilometers, but we only know what happens at 600 kilometers where the model is clearly not consistent with the experimental results. The “margin of error” identified in the aforementioned studies is hereafter referred to as the “transport/diffusion margin of error” because these studies measured CALPUFF v. 5.8’s accuracy relative to long-range transport and diffusion.

Activities since Adoption of the BART Guidance:

There have only been two changes to the BART Guideline’s version of the CALPUFF modeling system since its adoption in 2005. Version 5.8 was actually adopted on July 29, 2007 after some initial bug fixes. But even that version had bugs that were pointed out soon afterward to the EPA Air Quality Modeling Group (AQMG) of the EPA Office of Air Quality Planning and Standards (OAQPS) which is responsible for the Guidelines and thus the preferred versions of the models. Finally, on December 4, 2013 (6 and ½ years later) EPA approved bug fixes to create version 5.8.4 used in the Utah modeling. No other enhancements to CALPUFF were allowed. Separately, on August 27, 2012 AQMG made a change to the preferred version of CALPOST to version 6.221 which allowed the use of the revised IMPROVE equation for visibility and has been used in the Utah modeling. No changes to CALPUFF itself occurred at that time.

The owners of CALPUFF (first TRC and then EXPONENT) have prepared more advanced versions of CALPUFF that have not been adopted by EPA. The focus of these advancements have been in providing better atmospheric chemistry based on twenty years of advancement in atmospheric chemistry science. AQMG has steadfastly refused to give anything more than lip service to these advancements and yet continuously criticizes CALPUFF for not having advanced chemistry.

In May 2012, EPA released a report entitled “Documentation of the Evaluation of CALPUFF and Other Long Range Transport Models Using Tracer Field Experiment Data”, EPA-454/R-12-003 (Environ Report). It used CALPUFF Version 5.8 (without bug fixes) to

evaluate the data bases cited above and two new ones; 1) the Cross Appalachian Tracer Experiment (CAPTEX) and the European Tracer Experiment (ETEX). CAPTEX covered distances of 100 to 1000 kilometers northeast from the release point in Dayton, Ohio. All of the receptors were in complex terrain crossing the Appalachian Mountains. This is actually more of a test of the meteorological model performance (CALMET) than the concentration model performance (CALPUFF). ETEX covered distances from 50 kilometers to 1,400 kilometers across Europe from a release point in France. Again, the emphasis of the analysis was getting the meteorology model (CALMET) to perform well.

The Environ Report also re-evaluated 2 other LRT models and a plethora of modifications to CALPUFF. The purpose of the report, to analyze CALPUFF performance, was a thinly veiled attempt by AQMG at EPA to replace CALPUFF. That is apparent because in each comparison CALPUFF performed the worst and the bias of the study has been pointed out by many since.

The Environ Report does provide statistical evaluations of the CALPUFF Mean Normalized Bias (MNB), essentially the margin of error, which is the objective of this report. The results can be summarized as follows:

Table 1: Margin of Error for CALPUFF

Comparisons to Field Studies				
		Maximum Observed Percent MNB*		Centerline Percent MNB
Great Plains				
	100 km,	65%		84%
	600 km.	-75%		-76%
Savannah River				
	100 km.	71%		221%
CAPTEX				
	all receptors 100-1000 km.		41%**	
ETEX				
	all receptors 50-1400 km.		320%**	
* Mean Normalized Bias				
**Normalized Mean Square Error				

Appendix B



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

OCT 13 2016

Mr. Stuart Spencer
Associate Director, Office of Air Quality
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

Dear Mr. Spencer:

I am writing today to provide our preliminary views on supplemental comments received from Entergy regarding a proposed alternative strategy for their White Bluff facility. These comments were received on August 8, 2016, well outside the comment period, and therefore could not be considered in our final Federal Implementation Plan (FIP) action, for which we were under a court-ordered deadline of August 31, 2016 (*Sierra Club v. Gina McCarthy*, No. 4:14CV00643JLH (ED Ark. Western Div. Nov. 3, 2015)). We believe, however, that the alternative plan proposed by Entergy in their comments has potential merit with respect to addressing the best available retrofit technology (BART) requirements for White Bluff, and if the issues identified in the enclosure were to be addressed, could provide the basis for an approvable State Implementation Plan (SIP) revision. If Arkansas believes that Entergy's alternative plan is a more appropriate course, we would be happy to continue to work with you on such a SIP revision that could replace the FIP requirements for the White Bluff units.

Please contact me at 214-665-7548, or Guy Donaldson, of my staff, at 214-665-7242, if you would like to discuss further.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark Hansen".

Mark Hansen
Associate Director for
Air, Multimedia Division

Enclosure

cc: Kelly McQueen
Assistant General Counsel, Entergy

Enclosure:

Entergy's August 8, 2016 letter requests that the sulfur dioxide (SO₂) BART determination for the White Bluff units be either an emission limit of 0.06 lb/MMBtu on a 30 boiler-operating-day rolling average consistent with the installation of dry flue gas desulfurization (dry FGD), or as an alternative to the installation of these controls, a binding requirement to (1) cease coal fired operation at one unit by the end of 2025 and the other unit by the end of 2026 and (2) limit the operation of one unit to a capacity factor of no greater than 50 percent in 2025. In addition, Entergy requests a revised nitrogen oxide (NO_x) BART emission limit of 1,305 lb/hr for periods when the White Bluff units are operating at a low capacity factor. Based on the information provided in the August 8, 2016 comment letter, an approvable SIP revision that includes Entergy's requested BART determinations for White Bluff must also include certain additional information and documentation to fully support those BART determinations. The additional information and documentation that are needed are discussed in the paragraphs that follow.

Enforceable Mechanism

If Arkansas agrees that it would be appropriate to take the alternative approach for White Bluff, the SIP revision must include an enforceable mechanism which requires that Entergy (1) cease coal combustion at White Bluff by the end of 2025 at one unit and by the end of 2026 at the other unit, and (2) limit operation of one unit to a capacity factor of no greater than 50 percent in 2025.

Revised dry FGD Cost Analysis

As part of the BART analysis, a demonstration that dry FGD is no longer cost-effective in light of a shorter remaining useful life for the White Bluff units must be included in the SIP revision. Entergy's August 8, 2016 letter includes an updated BART analysis of the five statutory BART factors. In this analysis, Entergy relies on the cost analysis prepared in 2015 by Sargent & Lundy (2015 Sargent & Lundy cost analysis), and indicates that the cost effectiveness of dry FGD would range from \$10,400 to \$11,800/ton removed at each unit if coal combustion were to cease in 2025 and 2026. As discussed in our Arkansas FIP signed on August 31, 2016, the 2015 Sargent & Lundy cost analysis presents problems that prevented us from using it in our FIP, primarily because it is undocumented. For example, the 2015 Sargent & Lundy cost analysis uses a 2013 Alstom quote as its basis, but the 2013 Alstom quote is not provided in the 2015 Sargent & Lundy cost analysis. This omission prevents us from verifying the scope of work covered in that cost analysis. In addition, certain costs included in the 2015 Sargent & Lundy cost analysis were not documented. An approvable SIP revision that relies on the 2015 Sargent & Lundy cost analysis must include corrections of the issues we identified with that cost analysis, as discussed in our Arkansas FIP. Alternatively, the SIP revision could rely on our revised cost analysis for dry FGD, as presented in our Arkansas FIP, to calculate the cost effectiveness of dry FGD in light of the shorter remaining useful life.

Additionally, in the updated BART five factor analysis provided in Entergy's letter, the cost effectiveness of dry FGD controls was calculated based on an assumption that the annual emissions reductions achieved with dry FGD would be lower if the unit were restricted to operate at a capacity factor of no greater than 50 percent in 2025. Additional explanation of how the annual emissions reductions were calculated and the calculations themselves must be provided to properly support the assumed annual emissions reductions. The updated BART five factor analysis also includes a revision of

the direct variable and fixed operation and maintenance (O&M) costs to reflect operating at a capacity factor of no greater than 50 percent in 2025. The calculations of the revised direct variable and fixed O&M costs must be provided.

Evaluation of DSI as an Interim Control

As discussed in our Arkansas FIP, because section 51.308(e)(1) and the BART guidelines require that a subject-to-BART source install and operate the best available emission reduction technology based on the five statutory factors, it is necessary to consider whether there are any additional SO₂ control measures (beyond the interim SO₂ emission limit of 0.6 lb/MMBtu proposed by Entergy) that constitute BART during the interim period before coal combustion ceases at the White Bluff units. In particular, dry sorbent injection (DSI) has a relatively low capital cost and may be cost effective even if operated for a short period of time. An approvable SIP revision must include a full BART analysis that considers and evaluates DSI to determine if it constitutes BART during the interim period. This evaluation must include the following:

- Evaluation of the feasibility and capability of DSI at the White Bluff units, including the anticipated range of emissions reductions. This may include evaluation of the existing particulate matter (PM) control equipment and any need for potential additional PM control equipment to handle the additional PM load. The BART analysis must include documentation of the need for any additional PM control equipment needed to handle the additional PM load.
- Cost evaluation of DSI and any necessary additional PM control equipment (including supporting documentation) that takes into consideration the remaining useful life of the units.
- Evaluation of the potential visibility benefits of DSI controls.
- Evaluation of any energy and non-air quality environmental impacts of DSI controls.

Entergy's Refined NO_x BART Emission Limit

With regard to appropriate NO_x BART limits, Entergy's letter states that it "has refined its analysis of the proposed NO_x limitation," and determined that a NO_x emission limit of 1,305 lb/hr is achievable and appropriate as NO_x BART for the White Bluff units when they are operated at less than 50 percent of capacity. While we understand Entergy's concerns about not being able to meet an emission limit of 0.15 lb/MMBtu on a 30 boiler-operating-day rolling average when the units are operated at less than 50 percent of capacity, there is no information presented in Entergy's letter to demonstrate that an emission limit of 1,305 lb/hr is sufficiently protective or appropriate when the units are operated at low capacity. In particular, we discussed in our Arkansas FIP that the 1,342.5 lb/hr emission limit Entergy initially requested in the comments submitted during the comment period appeared to be based on the maximum heat input rating for each unit and therefore was not an appropriate emission limit for operation at low capacity. The revised emission limit Entergy requests in the August 8, 2016 letter is only slightly lower. Entergy provided no information demonstrating that this limit would be sufficiently protective or appropriate when the units are operated at low capacities considering that NO_x emissions on a mass basis are expected to be lower when the units are operated at low capacity compared to operation at high capacity. As the Regional Haze Rule requires the identification and evaluation of the highest level of control a particular control technology is capable of achieving (see 64 FR at 35740), additional information must be provided to document and demonstrate that 1,305 lb/hr is appropriate and sufficiently controls NO_x emissions using LNB/SOFA when the units are operated at less than

50 percent of capacity. This additional information could consist of the refined analysis Entergy mentions in page 5 of the supplemental comments attached to the August 8, 2016 letter and/or a vendor guarantee.

Entergy's Updated NO_x Control Costs

Entergy's August 8, 2016 letter provides an updated calculation of the cost effectiveness of NO_x controls that takes into consideration a shortened remaining useful life for the White Bluff units. The updated calculation of the cost effectiveness of NO_x control costs appears to be based on the cost analysis included in Entergy's "Revised BART Five Factor Analysis for White Bluff Steam Electric Station Redfield, Arkansas (AFIN 35-00110)," dated October 2013. As discussed in our FIP proposal (see 80 FR at 18973), that cost analysis of NO_x controls included certain line items that were not documented by Entergy and do not appear to be valid costs under the Control Cost Manual methodology. The updated calculation of the cost effectiveness of NO_x controls must be based on a cost analysis that either properly documents these line items or eliminates them from the total annual cost estimate.

Additionally, Entergy's updated calculation of the cost effectiveness of NO_x controls assumes that the annual emissions reductions achieved would be lower if the unit is restricted to operate at a capacity factor of no greater than 50 percent in 2025. Additional explanation of how the annual emissions reductions were calculated and the calculations themselves must be provided to properly support the assumed annual emissions reductions. In the updated cost analysis, Entergy also revised the direct variable and fixed O&M costs of NO_x controls to reflect operating at a capacity factor of no greater than 50 percent in 2025. The calculation of the revised direct variable and fixed O&M costs must be provided.

CSAPR Better than BART

As discussed in our Arkansas FIP, we proposed and ultimately finalized source specific NO_x BART determinations for Arkansas' electric generating units (EGUs) instead of relying on the Cross State Air Pollution Rule (CSAPR) because at the time of our proposed action, this approach properly accounted for uncertainty in the CSAPR better-than-BART regulation created by ongoing litigation regarding the CSAPR program. This approach was also consistent with Arkansas' earlier decision to conduct source-specific NO_x BART determinations in lieu of relying on CSAPR's predecessor, the Clean Air Interstate Rule, to meet the BART requirements. In addition, after we proposed the Arkansas FIP, the D.C. Circuit issued a July 2015 decision in *EME Homer City Generation v. EPA* upholding CSAPR but remanding without vacatur a number of the Rule's state NO_x and SO₂ emissions budgets (795 F.3d 118 (D.C. Cir 2015)). Arkansas' ozone season NO_x budget is not itself affected by the remand. However, the Court's remand of the affected states' emissions budgets has implications for CSAPR better-than BART, since the demonstration underlying that rulemaking relied on the emission budgets of all states subject to CSAPR, including those that the D.C. Circuit remanded, to establish that CSAPR provides for greater reasonable progress than BART. We are in the process of acting on the Court's July 2015 remand. On September 7, 2016, we finalized an update to the CSAPR ozone season program by issuing the CSAPR Update. This rule addresses the summertime (May – September) transport of ozone pollution in the eastern United States that crosses state lines to help downwind states and communities meet and maintain the 2008 ozone national ambient air quality standard (NAAQS), and also responds to the Court's remand of the Phase 2 ozone season NO_x budgets for 11 states. The CSAPR Update also

promulgates a FIP for Arkansas that establishes an EGU NO_x ozone season emission budget to reduce interstate transport for the 2008 ozone NAAQS. We are in the process of responding to the Court's remand of the Phase 2 SO₂ emission budgets for four states, consistent with the planned response we outlined in a June 2016 memorandum.¹ We expect that the uncertainty created by the D.C. Circuit's remand of the affected states' emission budgets will shortly be resolved. The CSAPR Update does not include determinations or establish any presumptions that compliance with that rule satisfies NO_x BART for EGUs. However, the Environmental Protection Agency's preliminary analysis indicates that CSAPR participation will remain an appropriate BART alternative for all states participating in CSAPR (either by FIP or SIP adoption). We intend to determine whether compliance with CSAPR will continue to be an appropriate BART alternative in another rulemaking soon that takes into account the changes to CSAPR following the July 2015 remand. If EPA finds that CSAPR continues to provide for greater reasonable progress than BART,² the State may submit a SIP revision that includes reliance on CSAPR to satisfy the NO_x BART requirements for Arkansas' EGUs instead of doing source-specific NO_x BART determinations.

Additional Information on Operation After Coal Combustion Ceases

Entergy's August 8, 2016 letter indicates that it anticipates ceasing coal combustion at White Bluff by the end of 2025 at one unit and 2026 at the other unit. A SIP revision that assumes a shorter remaining useful life for the units should include a discussion of the fuel types Entergy anticipates using after coal combustion ceases, including whether there will be a limit on the sulfur content of any fuel oil burned at the units.

¹ https://www3.epa.gov/airtransport/CSAPR/pdfs/CSAPR_SO2_Remand_Memo.pdf

² Alternatively, Arkansas could conduct an analysis that demonstrates compliance with the CSAPR Update for certain EGUs in Arkansas fulfills NO_x BART for those EGUs.

Appendix C

CONSIDERATIONS FOR A REVISED FIVE-FACTOR ANALYSIS FOR LOW-SULFUR COAL AS BART

a. Cost of Compliance

In contrast to Flue Gas Desulfurization, low-sulfur coal would be cost effective over the remainder of the first planning period, which ends in 2018. EPA underestimates certain costs and overestimates emission reductions with respect to installation of scrubbers according to a report prepared for Entergy by engineering firm Sargent and Lundy, LLC (“S & L”).¹ Taken in combination, EPA’s assumptions artificially lower the annual cost and cost-effectiveness (\$/ton reduced annually) estimates. The S & L report estimates that the actual cost-effectiveness for scrubbers would be between \$5,462 – \$6,445 more expensive per ton of SO₂ reduced than EPA’s estimate in the FIP. Due to market conditions for coal and natural gas, Entergy White Bluff has seen a decrease in dispatch that is expected to continue during this planning period resulting in a reduction in annual SO₂ emissions. Units 1 and 2 are currently permitted to emit 45,727.2 tons per year (tpy) SO₂ (10,440.0 lb SO₂/hr) each or 91,454.4 tpy SO₂ (20,880 lb SO₂/hr) combined.² Annual emissions for Entergy White Bluff units 1 and 2 combined from 2008 – 2014 ranged from 31,684 – 37,939 tpy SO₂—less than half of total allowable emissions in their permit.³ Annual emissions from Entergy White Bluff dropped to 20,480 tpy SO₂ in 2015.⁴ Based on a comparison of 2015 and 2016 Quarters 1 – 3 data submitted to the Air Markets Program Division

¹ *Review of EPA’s Cost Analysis for Arkansas Regional Haze Proposed Federal Implementation Plan* (2015). Prepared by Sargent & Lundy for Entergy Arkansas, Inc., Docket No. EPA-R06-OAR-2015-0189.

² Entergy Arkansas, Inc. – White Bluff, Permit No. 0263-AOP-R10, AFIN: 35-00110

³ 2009 Arkansas Department of Environmental Quality Emissions Inventory, 2010 Arkansas Department of Environmental Quality Emissions Inventory, 2011 National Emissions Inventory Version 2, 2012 Arkansas Department of Environmental Quality Emissions Inventory, 2013 Arkansas Department of Environmental Quality Emissions Inventory, 2014 National Emissions Inventory Version 1

<<https://eis.epa.gov/eis-system-web>>

⁴ Air Markets Program Data: Air Markets Program Data: Annual SO₂ Data for Entergy White Bluff for 2015
<<https://ampd.epa.gov/ampd/>>

of EPA, 2016 SO₂ emissions from Entergy White Bluff are on track to be even lower than 2015 SO₂ emissions. Because Entergy White Bluff's actual emissions are much lower than permitted and emissions from Entergy White Bluff are expected to continue to remain low due to economic dispatch throughout the remainder of the current Regional Haze planning period, it does not make sense to require installation of costly controls during the 2008 – 2018 planning period based on the assumption that Entergy will run at a greater capacity than is economically realistic.

EPA's BART determination overstates the cost-effectiveness of installing scrubbers at Entergy White Bluff. EPA underestimates certain costs, makes unreasonable assumptions with respect to the amortization period for the scrubbers, and makes errors in calculating baseline emissions and achievable emission reductions.⁵ EPA estimates the cost-effectiveness of scrubbers at Entergy White Bluff units 1 and 2 to be \$2,227/ ton and \$2,101, respectively. By contrast, total cost-effectiveness estimated by S & L ranges from \$6,097 – \$8,599, depending on the unit and remaining useful life assumptions.⁶

b. Existing Controls in Use at the Source

Second, the existing emissions in controls in use at the facility include low-sulfur coal and an enforceable emission rate appropriate for such a BART determination would solidify the improvements that these controls have already made during this planning period and ensure their continued operation until the next planning period. The current permitted emission rate for units 1 and 2 at Entergy White Bluff is 1.2 lb SO₂/million British Thermal Units (MMBtu) based on

⁵ *Review of EPA's Cost Analysis for Arkansas Regional Haze Proposed Federal Implementation Plan* (2015). Prepared by Sargent & Lundy for Entergy Arkansas, Inc. Docket No. EPA-R06-OAR-2015-0189.

⁶ *Id.*

the new source performance standard for fossil-fuel fired steam generators.⁷ Entergy White Bluff is currently using lower sulfur content coal to minimize costs of compliance with the Acid Rain Program. Using low sulfur coal, Entergy White Bluff has been able to achieve monthly average emission rates in the range of 0.46 – 0.69 lb SO₂/MMBtu.⁸ The average monthly emission rate between 2009 and 2015 was 0.56 lb SO₂/MMBTU for unit 1 and 0.58lb SO₂/MMbtu for unit 2.⁹ Consequently, Entergy White Bluff has already lowered its visibility impact on potentially impacted federal Class I areas during this planning period beyond what would be expected due to emissions at its permitted emission rate. Setting a BART limit based on 0.6 lb SO₂/MMbtu on a 30-day rolling average would render the use of lower sulfur coal permanent and enforceable ensuring the continuation of reduced sulfur dioxide emissions from Entergy White Bluff and the associated visibility improvements at federal Class I areas.

c. Remaining Useful Life

S & L asserts that EPA arbitrarily assumed a longer remaining useful life and lower costs associated with balance of plant costs, owner's cost, escalation, and operating costs. EPA used the estimated life of the scrubber (30 years) for amortization rather than the remaining useful life of the Entergy White Bluff units. This method of amortization is particularly misleading given EPA's typical modeling assumptions use a 40-year book life for coal-fired power plants and a 15 year schedule for financing environmental retrofits. Entergy White Bluff unit 1 began operation in 1980 and unit 2 began operation in 1981. Units 1 and 2 will reach their 40th year in 2020 and 2021, respectively; therefore, an assumption of a 30-year amortization period starting in 2021

⁷ 40 CFR 60.42b(b)

⁸ Air Markets Program Data: Monthly Heat Input and SO₂ Data for Entergy White Bluff for 2009 – 2015
<<https://ampd.epa.gov/ampd/>>

⁹ Id.

does not reasonably take into account remaining useful life of the units. Coal-fired power plants may continue to operate beyond the 40-year book life assumption; but, it is unlikely that these units would operate 30 additional years beyond their book life.

d. Visibility Improvement

Most importantly, the visibility benefits from a low-sulfur coal BART determination would actually occur during this planning period. Requiring compliance with an emission limit appropriate to White Bluff's use of low-sulfur coal would have benefit of being feasible to implement in matter weeks as opposed to years. In addition, this consolidates the visibility improvement that has allowed Arkansas to exceed the FIP's reasonable progress goals for this planning period. In contrast, EPA the installation of dry scrubbers at White Bluff is not feasibility before the end of this planning period in 2018.

